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Assembly and method for separating gas from flowing liquidsRECEIVED
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5 The present invention relates to an assembly in accordance with the pre-
amble of claim 1 for separating gas from flowing liquids handled in a process
industry.

10 Gases such as air entrained in liquids handled in a process industry are often
problematic. The complications occur most frequently in the pumping or
measurement of liquids. Gas, particularly air, carried abundantly along with
liquids complicates measurements imposed on liquids whereby typically the
sensing results become inaccurate and unreliable. Moreover, since air also
causes other process complications such as microbial growth, it is most
advantageous to separate entrained air.

15 Conventionally, gas separation from flows of minor volumetric rate has been
carried out by passing the end of a pipe under the surface of water. The
purpose of keeping the pipe end submerged under water is to form a water
trap to the outlet of the pipe. However, a problem arises at high flow rates
20 therefrom that water can transport the air as bubbles along with its flow,
whereby gravity buoyancy of the bubbles does not impart them a sufficient
large upward velocity to move them against the flow fast enough to overcome
the downward velocity of the water flow.

25 The present invention is directed to provide an arrangement capable of
eliminating the above-described problems. It is a particular object of the
invention is provide both an apparatus and a method for separating gas from
a liquid. The characterizing features of the invention are disclosed in the
appended claims specifying a novel arrangement for separating gases from a
30 liquid handled in a process industry.

More specifically, the assembly for separation of gas-containing liquids, par-

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ticularly for separating air therefrom, is characterized by having a liquid-flow guide adapted to the lower end of the inlet pipe discharging gas-containing liquid into a container.

5 In the following, the invention is described in more detail with the help of an exemplary embodiment by making reference to the appended drawings in which

10 FIG. 1 a flow guide according to the invention for separating gas from the flow of gas-containing liquids handled in a process industry;

FIG. 2 shows an embodiment of a liquid flow measurement arrangement according to the invention; and

15 FIG. 3 shows an embodiment of a liquid flow receiver container according to the invention.

20 Now referring to FIG. 1, a guide 2 of a liquid flow 7 is mounted essentially to the lower end of an inlet pipe 1 discharging gas-containing liquid into a container. The height position of the flow guide 2 in the vertical direction is adjustable with the help of fixture means 13 for optimizing the separation efficiency. Depending on the type of the liquid being handled in the process, the shape of flow guide 2 can be made essentially flat, upward concave or downward convex. Advantageously, the bottom of the flow guide 2 is made
25 concave so that its edges are curved upward toward the liquid level surface. More precisely, the flow guide 2 is made from sheet metal, perforated plate or sheet material having a desired contour such as undulated plate. As shown in FIG. 1, the flow guide 2 is advantageously mounted on support rods 10 or the like elements that displace the flow guide substantially at a distance from
30 the lower end of the inlet pipe 1. The shape and material of the flow guide can be varied as required. The optimum dimensions of the flow guide are determined by several design factors such as the kind of fluid flowing in the

process, the viscosity, temperature, gas/air concentration 9 thereof and the velocity of the liquid flow 7. The final design can be best optimized with the help of laboratory tests.

5 In FIG. 2 is shown a preferred exemplary embodiment adapted for flow measurements, whereby the function of the flow guide 2 is to deflect the liquid flow 7 so as to direct the flow toward the liquid level surface. The flow guide 2 makes it easier to direct the liquid flow 7 formed by water with entrained air upward toward the liquid level surface thus facilitating the separation of air 9 from water 7 in order to further provide a solid flow 8. Herein it must be understood that in a conventional arrangement the liquid flow 7 takes place in a consistently downward direction which makes the separation of air bubbles 9 very difficult. Further aiding the function of flow guide 2 in the embodiment according to the invention, the design of a container 11 serving as a liquid receiving vessel is advantageously made such that the flow velocity becomes sufficiently slow to augment the separation of air bubbles 9. Additional stabilization of the solid flow 8 is gained from the use of a partition 3 and a narrow channel 6 at the bottom of the container.

20 In FIG. 3 is shown an exemplary embodiment wherein the flow guide 2 is adapted to a gas-separating container. In this example, the flow guide 2 is mounted essentially in the fashion as in FIG. 1 to the lower end of an inlet pipe 1 discharging gas-containing liquid into a container. On the above-described grounds, this embodiment according to the invention can be used in a great number of applications dealing with a liquid flow 7 carrying entrained gas, most typically air 9, that is desired to be efficiently separated or at least reduced down to a suitable level. In a process industry, such problems are encountered probably most frequently in the pumping of liquids and measurements performed thereon. The inventive spirit of the present arrangement is based on guiding air 9 and other entrapped gas bubbles toward the surface level of a liquid container thus augmenting and speeding up the removal of entrained gas. The arrangement according to the invention

can be used in almost any type of inlet pipe 1 of measurement vessels and containers wherein the removal of air 9 and other gases is desired to be augmented.

- 5 To a person skilled in the art it is obvious that the invention is not limited by the above-described exemplary embodiments, but rather may be varied within the inventive spirit and scope of the appended claims.

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